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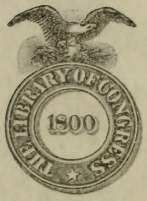

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BOOK OF
BENDING ALLOWANCE TABLES
FOR
ALUMINUM, COPPER, BRASS AND COLD ROLLED STEEL
OF
VARYING DEGREES AND RADII
WITH
EXPLANATORY NOTES

COMPILED BY
WARREN A. ROOKE, S.B.
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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INTRODUCTORY

IN COMPILING THIS BOOK OF TABLES THE AUTHOR HAS FOUR AIMS.

FIRST. TO ENABLE ANYONE TO OBTAIN EASILY AND CORRECTLY ANY REQUIRED FLAT PATTERN LENGTH.

SECOND. TO SAVE TIME FOR BOTH DRAFTSMAN AND CHECKER BY ELIMINATING ALL CALCULATIONS.

THIRD. TO AVOID DISCUSSION BETWEEN CHECKER AND DRAFTSMAN BY HAVING AUTHORITATIVE TABLES FOR INSTANT REFERENCE.

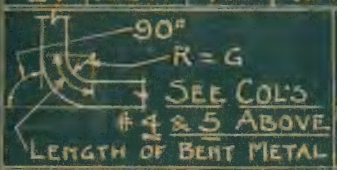
FOURTH. TO AVOID CONFUSING DRAFTSMAN BY SUBORDINATING THE EMPIRICAL FORMULA, AND PRESENTING CALCULATIONS IN THEIR SIMPLEST FORM.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = N(.0175 R + .0055 G).

FLAT PATTERN LENGTHS OF ALUMINUM BENT ANGLES OF 90°, 45°, 18°, 15° & 1°.

WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT.

COL. #1	COL. #2	COL. #3	COL. #4	COL. #5	COL. #6
BROWNE & SHARPE GAUGE.			90° LENGTH.		1° LENGTH.
GAUGE No	SIZE	APPROX. FRACTN	DECIMAL	APPROX FRACTN.	DECIMAL.
8	.1285	1/8 +	.26599	17/64 +	.002955
9	.1144	7/64 +	.23680	15/64 +	.002631
10	.1019	7/64 -	.21093	13/64 +	.002343
11	.0907	3/32 -	.18774	3/16 +	.002086
12	.0808	5/64 +	.16725	11/64 -	.001858
13	.0720	5/64 -	.14904	5/32 -	.001656
14	.0641	1/16 +	.13268	1/8 +	.001474
15	.0571	1/16 -	.11819	1/8 -	.001313
16	.0508	3/64 +	.10515	7/64 -	.001168
17	.0453	3/64 -	.09377	3/32	.0010419
18	.0403	3/64 -	.08342	5/64 +	.0009269
19	.0359	1/32 +	.07431	5/64 -	.0008257
20	.0320	1/32 +	.06624	1/16 +	.000736
21	.0285	1/32 -	.05899	1/16 -	.0006555
22	.0253	1/32 -	.05237	3/64 +	.0005819
23	.0226	1/64 +	.04678	3/64	.0005198
24	.0201	1/64 +	.04160	3/64 -	.0004623



SEE COL'S #4 & 5 ABOVE.

LENGTH OF BENT METAL

SEE NOTE BELOW

LENGTH OF BENT METAL.

45° LENGTH = $\frac{\text{DECIMAL IN COL. \#4 ABOVE, \& OPPOSITE PROPER GAUGE}}{2}$

18° LENGTH = $\frac{\text{DECIMAL IN COL. \#4 ABOVE \& OPPOSITE PROPER GAUGE}}{5}$

15° LENGTH = $\frac{\text{DECIMAL IN COL \#4 ABOVE \& OPPOSITE PROPER GAUGE}}{6}$

NOTE. FOR LENGTH OF METAL IN ANY OTHER ANGLE NOT GIVEN IN STANDARD ALCO TABLES, MULTIPLY DECIMAL IN COL. #6 ABOVE, (AND OPPOSITE PROPER GAUGE) BY THE NUMBER OF DEGREES IN BEND OF METAL.

W.A. ROOKE, S.B. 5-24-18.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = N(.0175 R + .0055 G)

FLAT PATTERN LENGTHS OF ALUMINUM BENT ANGLES OF 85° & 80°

WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT.

COL.#1.	COL.#2.	COL.#3.	COL.#4.	COL.#5.	COL.#6.	COL.#7.
BROWNE & SHARPE GAUGE.			85° LENGTH.		80° LENGTH.	
GAUGE NO.	SIZE.	APPROX. FRACT'N.	DECIMAL.	APPROX. FRACT'N.	DECIMAL.	APPROX. FRACT'N.
8	.1285	1/8+	.25117	1/4	.23640	15/64
9	.1144	7/64+	.22363	7/32+	.21048	13/64+
10	.1019	7/64-	.19915	13/64-	.18744	3/16
11	.0907	3/32-	.17731	11/64+	.16688	11/64-
12	.0808	5/64+	.15793	5/32	.14864	5/32-
13	.0720	5/64-	.14076	9/64	.13248	1/8+
14	.0641	1/16+	.12529	1/8	.11792	1/8-
15	.0571	1/16-	.11160	7/64+	.10504	7/64-
16	.0508	3/64+	.09928	3/32+	.09344	3/32-
17	.0453	3/64-	.08848	3/32-	.08335	5/64+
18	.0403	3/64-	.07871	5/64	.07415	5/64-
19	.0359	1/32+	.07018	1/16+	.06605	1/16+
20	.0320	1/32+	.06256	1/16	.05888	1/16-
21	.0285	1/32-	.05571	1/16-	.05244	3/64+
22	.0253	1/32-	.04945	3/64+	.04655	3/64
23	.0226	1/64+	.04417	3/64-	.04158	3/64-
24	.0201	1/64+	.03928	3/64-	.03698	1/32+

W.A. ROOKE, S.B. 7-15-18.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = N(.0175 R + .0055 G).

FLAT PATTERN LENGTHS OF ALUMINUM BENT ANGLES OF 75° & 70°

WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT.

COL.#1.	COL.#2.	COL.#3.	COL.#4.	COL.#5.	COL.#6.	COL.#7.
BROWNE & SHARPE GAUGE.			75° LENGTH.		70° LENGTH.	
GAUGE NO.	SIZE	APPROX. FRACT'N.	DECIMAL.	APPROX. FRACT'N.	DECIMAL.	APPROX. FRACT'N.
8	.1285	1/8+	.22162	7/32+	.20685	13/64+
9	.1144	7/64+	.19732	13/64-	.18417	3/16-
10	.1019	7/64-	.17572	11/64+	.16401	5/32+
11	.0907	5/32-	.15645	5/32	.14602	9/64+
12	.0808	5/64+	.13935	9/64-	.13006	1/8+
13	.0720	5/64-	.12420	1/8-	.11592	7/64+
14	.0641	1/16+	.11055	7/64+	.10318	7/64-
15	.0571	1/16-	.09847	3/32+	.09191	3/32-
16	.0508	3/64+	.08760	3/32-	.08176	5/64+
17	.0453	3/64-	.07814	5/64	.07293	5/64-
18	.0403	3/64-	.06951	1/16+	.06488	1/16+
19	.0359	1/32+	.06192	1/16-	.05779	1/16-
20	.0320	1/32+	.05520	1/16-	.05152	3/64+
21	.0285	1/32-	.04916	3/64+	.04588	3/64-
22	.0253	1/32-	.04364	3/64-	.04073	3/64-
23	.0226	1/64+	.03898	1/32+	.03638	1/32+
24	.0201	1/64+	.03467	1/32+	.03236	1/32

W.A. ROOKE, S.B. 6-26-18.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = 11(.0175 R + .0055 G)

FLAT PATTERN LENGTHS OF ALUMINUM BENT ANGLES OF 65° & 60°

WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT.

COL.#1.	COL.#2.	COL.#3.	COL.#4.	COL.#5.	COL.#6.	COL.#7.
BROWNE & SHARPE GAUGE.			65° LENGTH.		60° LENGTH.	
GAUGE No.	SIZE.	APPROX. FRACT'N.	DECIMAL.	APPROX. FRACT'N.	DECIMAL.	APPROX. FRACT'N.
8	.1285	1/8+	.19207	3/16+	.17730	11/64+
9	.1144	7/64+	.17101	11/64	.15786	5/32
10	.1019	7/64-	.15229	5/32-	.14056	9/64
11	.0907	3/32-	.13559	9/64-	.12516	1/8
12	.0808	5/64+	.12077	1/8-	.11148	7/64+
13	.0720	5/64-	.10764	7/64-	.09936	3/32+
14	.0641	1/16+	.09581	3/32+	.08844	3/32-
15	.0571	1/16-	.08534	5/64+	.07878	5/64
16	.0508	3/64+	.07592	5/64-	.07008	1/16+
17	.0453	3/64-	.06772	1/16+	.06251	1/16
18	.0403	3/64-	.06024	1/16-	.05561	1/16-
19	.0359	1/32+	.05367	3/64+	.04954	3/64+
20	.0320	1/32+	.04784	3/64	.04416	3/64-
21	.0285	1/32-	.04260	3/64-	.03933	3/64-
22	.0253	1/32-	.03782	1/32+	.03491	1/32+
23	.0226	1/64+	.03378	1/32+	.03118	1/32
24	.0201	1/64+	.03004	1/32	.02773	1/32-

W. A. ROOKE, S.B. 6-24-18

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = N(.0175 R + .0055 G).

FLAT PATTERN LENGTHS
OF ALUMINUM BENT ANGLES OF 55° & 50°
WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT.

COL.#1	COL.#2	COL.#3	COL.#4	COL.#5	COL.#6	COL.#7
BROWNE & SHARPE GAUGE.			55° LENGTH.		50° LENGTH.	
GAUGE No.	SIZE	APPROX FRACT'N.	DECIMAL.	APPROX. FRACT'N.	DECIMAL.	APPROX. FRACT'N.
8	.1285	1/8 +	.16252	5/32 +	.14775	9/64 +
9	.1144	7/64 +	.14470	9/64 +	.13155	1/8 +
10	.1019	7/64 -	.12886	1/8 +	.11715	7/64 +
11	.0907	3/32 -	.11473	7/64 +	.10430	7/64 -
12	.0808	5/64 +	.10218	7/64 -	.09290	3/32 -
13	.0720	5/64 -	.09108	3/32 -	.08280	5/64 +
14	.0641	1/16 +	.08107	5/64 +	.07370	5/64 -
15	.0571	1/16 -	.07221	5/64 -	.06565	1/16 +
16	.0508	3/64 +	.06424	1/64 +	.05840	1/16 -
17	.0453	3/64 -	.05729	1/16 -	.05209	3/64 +
18	.0403	3/64 -	.05097	3/64 +	.04634	3/64
19	.0359	1/32 +	.04541	3/64 -	.04128	3/64 -
20	.0320	1/32 +	.04048	3/64 -	.03680	1/32 +
21	.0285	1/32 -	.03605	1/32 +	.03277	1/32 +
22	.0253	1/32 -	.03200	1/32 +	.02909	1/32 -
23	.0226	1/64 +	.02858	1/32 -	.02599	1/32 -
24	.0201	1/64 +	.02542	1/32 -	.02311	1/64 +

W. A. ROOKE S.B. 6-18-18.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = N(.0175 R + .0055 G).

FLAT PATTERN LENGTHS OF ALUMINUM BENT ANGLES OF 45° & 40°

WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT.

COL.#1	COL.#2	COL.#3	COL.#4	COL.#5	COL.#6	COL.#7
BROWNE & SHARPE GAUGE.			45° LENGTH.		40° LENGTH.	
GAUGE No.	SIZE.	APPROX. FRACT'N.	DECIMAL	APPROX. FRACT'N	DECIMAL	APPROX. FRACT'N.
8	.1285	1/8+	.13299	1/8+	.11820	1/8-
9	.1144	7/64+	.11840	1/8-	.10524	7/64-
10	.1019	7/64+	.10547	7/64-	.09372	3/32
11	.0907	3/32+	.09387	3/32	.08344	5/64+
12	.0808	5/64+	.08363	5/64+	.07432	5/64-
13	.0720	5/64-	.07452	5/64-	.06624	1/16+
14	.0641	1/16+	.06634	1/16+	.05896	1/16-
15	.0571	1/16-	.05909	1/16-	.05252	3/64+
16	.0508	3/64+	.05258	3/64+	.04672	3/64
17	.0453	3/64-	.04689	3/64	.04167	3/64-
18	.0403	3/64-	.04171	3/64-	.03707	1/32+
19	.0359	1/32+	.03716	1/32+	.03302	1/32+
20	.0320	1/32+	.03312	1/32+	.02944	1/32-
21	.0285	1/32-	.02949	1/32-	.02622	1/32-
22	.0253	1/32-	.02624	1/32-	.02327	1/64+
23	.0226	1/64+	.02339	1/64+	.02079	1/64+
24	.0201	1/64+	.0208	1/64+	.01849	1/64+

W.A. ROOKE, S.B. 6-7-18.

NOTE THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = N(.0175 R + .0055 G).

FLAT PATTERN LENGTHS OF ALUMINUM BENT ANGLES OF 35° & 30°

WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT.

COL.#1.	COL.#2.	COL.#3.	COL.#4.	COL.#5.	COL.#6.	COL.#7.
BROWNE & SHARPE GAUGE.			35° LENGTH.		30° LENGTH.	
GAUGE No.	SIZE.	APPROX. FRACT'N.	DECIMAL.	APPROX. FRACT'N	DECIMAL.	APPROX. FRACT'N
8	.1285	1/8+	.10342	7/64-	.08865	3/32-
9	.1144	7/64+	.09208	3/32	.07893	5/64
10	.1019	7/64-	.08200	5/64+	.07029	1/16+
11	.0907	3/32-	.07301	5/64-	.06258	1/16
12	.0808	5/64+	.06503	1/16+	.05574	1/16-
13	.0720	5/64-	.05796	1/16-	.04968	3/64+
14	.0641	1/16+	.05159	3/64+	.04422	3/64-
15	.0571	1/16-	.04595	3/64	.03939	3/64-
16	.0508	3/64+	.04088	3/64-	.03504	1/32+
17	.0453	3/64-	.03646	1/32+	.03125	1/32
18	.0403	3/64-	.03244	1/32	.02780	1/32-
19	.0359	1/32+	.02889	1/32-	.02477	1/32-
20	.0320	1/32+	.02576	1/32-	.02205	1/64+
21	.0285	1/32-	.02294	1/64+	.01966	1/64+
22	.0253	1/32-	.02036	1/64+	.01745	1/64+
23	.0226	1/64+	.01819	1/64+	.01559	1/64
24	.0201	1/64+	.01618	1/64	.01386	1/64-

W.A. ROOKE, S.B. 6-14-18.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = N(.0175 R + .0055 G).

FLAT PATTERN LENGTHS OF ALUMINUM BENT ANGLES OF 25° & 20°

WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT.

COL.#1	COL.#2	COL.#3	COL.#4.	COL.#5	COL.#6	COL.#7
BROWNE & SHARPE GAUGE.			25° LENGTH.		20° LENGTH.	
GAUGE NO.	SIZE	APPROX. FRACT'N	DECIMAL.	APPROX. FRACT'N	DECIMAL.	APPROX. FRACT'N
8	.1285	1/8+	.07387	5/64-	.05910	1/16-
9	.1144	7/64+	.06577	1/16+	.05262	3/64+
10	.1019	7/64-	.05857	1/16-	.04686	3/64
11	.0907	3/32-	.05215	3/64+	.04172	3/64-
12	.0808	5/64+	.04645	3/64	.03716	1/32+
13	.0720	5/64-	.04140	3/64-	.03312	1/32+
14	.0641	1/16+	.03685	1/32+	.02948	1/32-
15	.0571	1/16-	.03282	1/32+	.02626	1/32-
16	.0508	3/64+	.02920	1/32-	.02336	1/64+
17	.0453	3/64-	.02604	1/32-	.02083	1/64+
18	.0403	3/64-	.02317	1/64+	.01853	1/64+
19	.0359	1/32+	.02064	1/64+	.01651	1/64+
20	.0320	1/32+	.01840	1/64+	.01472	1/64-
21	.0285	1/32-	.01638	1/64+	.01311	1/64-
22	.0253	1/32-	.01454	1/64-	.01163	1/64-
23	.0226	1/64+	.01299	1/64-	.01039	1/64-
24	.0201	1/64+	.01155	1/64-	.00924	1/64-

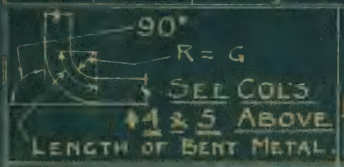
W.A.ROOKE, S.B. 6-10-18.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = N(.0175 R + .0055 G).

FLAT PATTERN LENGTHS OF STEEL BENT ANGLES OF 90° & 1°

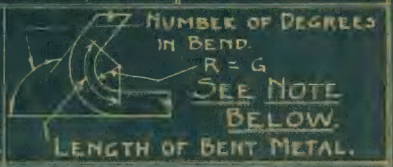
WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT.

COL.#1	COL.#2	COL.#3	COL.#4	COL.#5	COL.#6
BIRMINGHAM WIRE GAUGE.			90° LENGTH.		1° LENGTH.
GAUGE No.	SIZE	APPROX. FRACT'N.	DECIMAL	APPROX. FRACT'N.	DECIMAL.
1/4	.250	1/4	.51750	33/64+	.005750
4	.238	15/64+	.49266	1/2 -	.005474
5	.220	7/32+	.45540	29/64+	.005060
6	.203	13/64	42021	27/64-	.004669
3/16	.1875	3/16	38812	25/64-	.004312
8	.165	11/64-	.34155	11/32-	.003795
9	.148	5/32-	.30636	5/16-	.003404
10	.134	9/64-	.27738	9/32-	.003082
11	.120	1/8 -	.24840	1/4-	.002760
12	.109	7/64	.22563	7/32+	.002507
13	.095	3/32+	.19665	13/64-	.002185
14	.083	5/64+	.17181	11/64	.001909
15	.072	5/64-	.14904	5/32-	.001656
16	.065	1/16+	.13455	9/64-	.001495
17	.058	1/16-	.12006	1/8-	.001334
18	.049	3/64+	.10143	3/32+	.001127
19	.042	3/64-	.08694	3/32-	.000966
20	.035	1/32+	.07245	3/64-	.000805
21	.032	1/32+	.06624	1/16+	.000736
22	.028	1/32-	.05796	1/16-	.000644
23	.025	1/32-	.05175	3/64+	.000575
24	.022	1/64+	.04554	3/64-	.000506



SEE COLS #4 & 5 ABOVE.

LENGTH OF BENT METAL.



SEE NOTE BELOW.

LENGTH OF BENT METAL.

NOTE. FOR LENGTH OF METAL IN ANY OTHER ANGLE NOT GIVEN IN STANDARD AERO TABLES, MULTIPLY DECIMAL IN COL.#6 ABOVE, (AND OPPOSITE PROPER GAUGE) BY THE NUMBER OF DEGREES IN BEND OF METAL.

W.A. ROOKE, S.B. 6-3-18.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = N(.0175R + .0055G)

FLAT PATTERN LENGTHS OF STEEL BENT ANGLES OF 85° & 80°

WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT.

COL.#1	COL.#2	COL.#3	COL.#4	COL.#5	COL.#6	COL.#7
BIRMINGHAM WIRE GAUGE			85° LENGTH		80° LENGTH	
GAUGE NO.	SIZE	APPROX. FRACT'N	DECIMAL	APPROX FRACT'N	DECIMAL	APPROX. FRACT'N
1/4	.250	1/4	.48875	31/64 +	.46000	15/32 +
4	.238	15/64 +	.46529	15/32 +	.43792	7/16
5	.220	7/32 +	.43010	7/16 -	.40480	13/32
6	.203	13/64	.39686	25/64 +	.37352	3/8
3/16	.1875	3/16	.36652	23/64 +	.34496	11/32
8	.165	11/64 -	.32257	21/64 -	.30360	19/64 +
9	.148	5/32 -	.28934	19/64 -	.27232	17/64 +
10	.134	9/64 -	.26197	17/64 -	.24656	1/4 -
11	.120	1/8 -	.23460	15/64	.22080	7/32
12	.109	7/64	.21309	7/32 -	.20056	13/64 -
13	.095	3/32 +	.18572	3/16	.17480	11/64 +
14	.083	5/64 +	.16226	5/32 +	.15272	5/32 -
15	.072	5/64 -	.14076	9/64	.13248	1/8 +
16	.065	1/16 +	.12707	1/8	.11960	1/8 -
17	.058	1/16 -	.11339	7/64 +	.10672	7/64 -
18	.049	3/64 +	.09579	3/32	.09016	3/32 -
19	.042	3/64 -	.08211	5/64 +	.07728	5/64
20	.035	1/32 +	.06842	1/16 +	.06440	1/16
21	.032	1/32 +	.06256	1/16	.05888	1/16 -
22	.028	1/32 -	.05474	3/64 +	.05152	3/64 +
23	.025	1/32 -	.04887	3/64	.04600	3/64
24	.022	1/64 +	.04301	3/64 -	.04048	3/64 -

W.A. ROOKE, S.B. 7-15-18.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = N(.0175 R + .0055 G)

FLAT PATTERN LENGTHS OF STEEL BENT ANGLES OF 75° & 70°

WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT

COL.#1	COL.#2	COL.#3	COL. #4	COL.#5	COL. #6	COL #7
BIRMINGHAM WIRE GAUGE			75° LENGTH		70° LENGTH	
GAUGE No.	SIZE	APPROX FRACT'N	DECIMAL	APPROX. FRACT'N	DECIMAL	APPROX FRACT'N
1/4	.250	1/4	.43125	7/16 -	.40250	13/32 -
4	.238	15/64 +	.41055	13/32 +	.38318	25/64 -
5	.220	7/32 +	.37950	3/8 +	.35420	23/64 -
6	.203	13/64	.35017	11/32 +	.32683	21/64
3/16	.1875	3/16	.32340	21/64 -	.30184	19/64 +
8	.165	11/64 -	.28462	9/32 +	.26565	17/64
9	.148	5/32 -	.25530	1/4 +	.23828	15/64 +
10	.134	9/64 -	.23115	15/64 -	.21574	7/32 -
11	.120	1/8 -	.20700	13/64 +	.19320	3/16 +
12	.109	7/64	.18802	3/16	.17549	11/64 +
13	.095	3/32 +	.16387	5/32 +	.15295	5/32 -
14	.083	5/64 +	.14317	9/64 +	.13363	9/64 -
15	.072	5/64 -	.12420	1/8	.11592	7/64 +
16	.065	1/16 +	.11212	7/64 +	.10465	7/64 -
17	.058	1/16 -	.10005	3/32 +	.09338	3/32
18	.049	3/64 +	.08452	5/64 +	.07889	5/64
19	.042	3/64 -	.07245	5/64 -	.06762	1/16 +
20	.035	1/32 +	.06037	1/16	.05635	1/16 -
21	.032	1/32 +	.05520	1/16 -	.05152	3/64 +
22	.028	1/32 -	.04830	3/64	.04508	3/64
23	.025	1/32 -	.04312	3/64 -	.04025	3/64 -
24	.022	1/64 +	.03795	1/32 +	.03542	1/32 +

W.A.ROOKE, S.B. 7-15-18.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA
(BENDING) ALLOWANCE = N(.0175 R + .0055 G)

FLAT PATTERN LENGTHS
OF STEEL BENT ANGLES
OF 65° & 60°
WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT.

COL.#1	COL.#2	COL.#3	COL.#4	COL.#5	COL.#6	COL.#7
BIRMINGHAM WIRE GAUGE			65° LENGTH		60° LENGTH	
GAUGE NO.	SIZE	APPROX FRACTN	DECIMAL	APPROX FRACT'N	DECIMAL	APPROX FRACTN
1/4	.250	1/4	.37375	3/8	.34500	11/32
4	.238	15/64 +	.35581	23/64 -	.32844	21/64
5	.220	7/32 +	.32890	21/64	.30360	19/64 +
6	.203	13/64	.30348	19/64 +	.28014	9/32
3/16	.1875	3/16	.28028	9/32	.25872	17/64 -
8	.165	11/64 -	.24667	1/4 -	.22770	15/64 -
9	.148	5/32 -	.22126	7/32 +	.20424	13/64
10	.134	9/64 -	.20033	13/64 -	.18492	3/16 -
11	.120	1/8 -	.17940	11/64 +	.16560	11/64 -
12	.109	7/64	.16295	5/32 +	.15042	5/32 -
13	.095	3/32 +	.14202	9/64	.13110	1/8
14	.083	5/64 +	.12408	1/8	.11454	7/64 +
15	.072	5/64 -	.10764	7/64	.09936	3/32 +
16	.065	1/16 +	.09717	3/32 +	.08970	3/32 -
17	.058	1/16 -	.08671	3/32 -	.08004	5/64 +
18	.049	3/64 +	.07325	5/64 -	.06762	1/16 +
19	.042	3/64 -	.06279	1/16	.05796	1/16 -
20	.035	1/32 +	.05232	3/64 +	.04830	3/64
21	.032	1/32 +	.04784	3/64	.04416	3/64
22	.028	1/32 -	.04186	3/64 -	.03864	1/32 +
23	.025	1/32 -	.03737	1/32 +	.03450	1/32
24	.022	1/64 +	.03289	1/32	.03036	1/32

W.A.ROOKE, S.B. 7-15-18.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = N(.0175R + .0055G)

FLAT PATTERN LENGTHS OF STEEL BENT ANGLES OF 55° & 50°

WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT.

COL.#1	COL.#2	COL.#3	COL. #4	COL.#5	COL. #6	COL.#7
BIRMINGHAM WIRE GAUGE			55° LENGTH		50° LENGTH	
GAUGE No.	SIZE	APPROX FRACT'N	DECIMAL	APPROX. FRACT'N	DECIMAL	APPROX FRACT'N
1/4	.250	1/4	.31625	5/16 +	.28750	9/32 +
4	.238	15/64 +	.30107	19/64 +	.27370	17/64 +
5	.220	7/32 +	.27830	9/32 -	.25300	1/4 +
6	.203	13/64	.25679	1/4 +	.23345	15/64
3/16	.1875	3/16	.23716	15/64 +	.21560	7/32 -
8	.165	11/64 -	.20872	13/64 +	.18975	3/16
9	.148	5/32 -	.18722	3/16	.17020	11/64
10	.134	9/64 -	.16951	11/64	.15410	5/32
11	.120	1/8 -	.15180	5/32 -	.13800	9/64
12	.109	7/64	.13788	9/64 -	.12535	1/8
13	.095	3/32 +	.12017	1/8 -	.10925	7/64
14	.083	5/64 +	.10499	7/64 -	.09545	3/32
15	.072	5/64 -	.09108	3/32	.08280	5/64 +
16	.065	1/16 +	.08222	5/64 +	.07475	5/64 -
17	.058	1/16 -	.07337	5/64 -	.06670	1/16 +
18	.049	3/64 +	.06198	1/16	.05635	1/16 -
19	.042	3/64 -	.05313	3/64 +	.04830	3/64
20	.035	1/32 +	.04427	3/64	.04025	3/64 -
21	.032	1/32 +	.04048	3/64 -	.03680	1/32 +
22	.028	1/32 -	.03542	1/32 +	.03220	1/32
23	.025	1/32 -	.03162	1/32	.02875	1/32 -
24	.022	1/64 +	.02783	1/32 -	.02530	1/32 -

W.A.ROOKE, S.B. 7-15-18.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = N(.0175R + .0055G)

FLAT PATTERN LENGTHS OF STEEL BENT ANGLES OF 45° & 40°

WHEN RADIUS=GAUGE AND THERE IS NO REINFORCEMENT.

COL#1	COL.#2	COL.#3	COL.#4	COL.#5	COL.#6	COL.#7
BIRMINGHAM WIRE GAUGE			45° LENGTH		40° LENGTH	
GAUGE No.	SIZE	APPROX. FRACT'N	DECIMAL	APPROX FRACT'N	DECIMAL	APPROX. FRACT'N
1/4	.250	1/4	.25075	17/64 −	.23000	15/64 −
4	.238	15/64 +	.24633	1/4 −	.21896	7/32
5	.220	7/32 +	.22770	15/64 −	.20240	13/64
6	.203	13/64	.21010	13/64 +	.18676	3/16
3/16	.1875	3/16	.19404	3/16 +	.17248	11/64
8	.165	11/64 −	.17077	11/64 −	.15180	5/32 −
9	.148	5/32 −	.15318	5/32 −	.13616	9/64 −
10	.134	9/64 −	.13869	9/64 −	.12328	1/8
11	.120	1/8 −	.12420	1/8	.11040	7/64
12	.109	7/64	.11281	7/64 +	.10028	3/32 +
13	.095	3/32 +	.09832	3/32 +	.08740	3/32 −
14	.083	5/64 +	.08590	5/64 +	.07636	5/64
15	.072	5/64 −	.07452	5/64 −	.06624	1/16 +
16	.065	1/16 +	.06727	1/16 +	.05980	1/16 −
17	.058	1/16 −	.06003	1/16 −	.05336	3/64 +
18	.049	3/64 +	.05071	3/64 +	.04508	3/64
19	.042	3/64 −	.04347	3/64 −	.03864	1/32 +
20	.035	1/32 +	.03622	1/32 +	.03220	1/32
21	.032	1/32 +	.03312	1/32	.02944	1/32 −
22	.028	1/32 −	.02898	1/32 −	.02576	1/32 −
23	.025	1/32 −	.02587	1/32 −	.02300	1/64 +
24	.022	1/64 +	.02277	1/64 +	.02024	1/64 +

W.A.ROOKE, S.B. 7-15-18.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = .7854(.0175R + .0055G).

FLAT PATTERN LENGTHS OF STEEL BENT ANGLES OF 35° & 30°

WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT

COL. #1	COL. #2	COL #3	COL. #4	COL #5	COL. #6	COL. #7
BIRMINGHAM WIRE GAUGE			35° LENGTH		30° LENGTH	
GAUGE No.	SIZE	APPROX. FRACT'N	DECIMAL	APPROX. FRACT'N	DECIMAL	APPROX. FRACT'N
1/4	.250	1/4	.20125	13/64	.17250	11/64
4	.238	15/64 +	.19159	13/64 −	.16422	11/64 −
5	.220	7/32 +	.17710	11/64 +	.15180	5/32 −
6	.203	13/64	.16341	5/32 +	.14007	9/64
3/16	.1875	3/16	.15092	5/32 −	.12936	1/8 +
8	.165	11/64 −	.13282	9/64 −	.11385	7/64 +
9	.148	5/32 −	.11914	1/8 −	.10212	7/64 −
10	.134	9/64 −	.10787	7/64	.09246	3/32
11	.120	1/8 −	.09660	3/32 +	.08280	5/64 +
12	.109	7/64	.08774	3/32 −	.07521	5/64 −
13	.095	3/32 +	.07647	5/64	.06555	1/16 +
14	.083	5/64 +	.06681	1/16 +	.05727	1/16 −
15	.072	5/64 −	.05796	1/16 −	.04968	3/64 +
16	.065	1/16 +	.05232	3/64 +	.04485	3/64
17	.058	1/16 −	.04669	3/64	.04002	3/64 −
18	.049	3/64 +	.03944	3/64 −	.03381	1/32
19	.042	3/64 −	.03381	1/32	.02898	1/32 −
20	.035	1/32 +	.02817	1/32 −	.02415	1/32 −
21	.032	1/32 +	.02576	1/32 −	.02208	1/64 +
22	.028	1/32 −	.02254	1/64 +	.01932	1/64 +
23	.025	1/32 −	.02012	1/64 +	.01725	1/64
24	.022	1/64 +	.01771	1/64	.01518	1/64

W.A. ROOKE, S.B. 7-15-18.

NOTE. THE FOLLOWING TABLE IS BASED ON FORMULA (BENDING) ALLOWANCE = N(.0175R + .0055G).

FLAT PATTERN LENGTHS OF STEEL BENT ANGLES OF 25° & 20°

WHEN RADIUS = GAUGE AND THERE IS NO REINFORCEMENT

COL. #1	COL. #2	COL. #3	COL. #4	COL. #5	COL. #6	COL. #7
BIRMINGHAM WIRE GAUGE			25° LENGTH		20° LENGTH	
GAUGE No.	SIZE	APPROX. FRACT'N	DECIMAL	APPROX. FRACT'N.	DECIMAL	APPROX. FRACT'N.
1/4	.250	1/4	.14375	9/64 +	.11500	7/64 +
4	.238	15/64 +	.13685	9/64 -	.10948	7/64
5	.220	7/32 +	.12650	1/8	.10120	6/32 +
6	.203	13/64	.11672	7/64 +	.09338	3/32
3/16	.1875	3/16	.10780	7/64	.08624	3/32 -
8	.165	11/64 -	.09487	3/32	.07590	5/64 -
9	.148	5/32 -	.08510	5/64 +	.06808	1/16 +
10	.134	9/64 -	.07705	5/64	.06164	1/16
11	.120	1/8 -	.06900	1/16 +	.05520	1/16 -
12	.109	7/64	.06267	1/16	.05014	3/64 +
13	.095	3/32 +	.05462	1/16 -	.04370	3/64 -
14	.083	5/64 +	.04772	3/64	.03818	1/32 +
15	.072	5/64 -	.04140	3/64 -	.03312	1/32
16	.065	1/16 +	.03737	1/32 +	.02990	1/32
17	.058	1/16 -	.03335	1/32	.02668	1/32 -
18	.049	3/64 +	.02817	1/32 -	.02254	1/64 +
19	.042	3/64 -	.02415	1/32 -	.01932	1/64 +
20	.035	1/32 +	.02012	1/64 +	.01610	1/64
21	.032	1/32 +	.01840	1/64 +	.01472	1/64
22	.028	1/32 -	.01610	1/64	.01288	1/64 -
23	.025	1/32 -	.01437	1/64	.01150	1/64 -
24	.022	1/64 +	.01265	1/64 -	.01012	1/64 -

W. A. ROOKE, S.B. 7-15-18.

TABLE OF CONSTANTS FOR STEEL ONLY

FOR USE IN FORMULA

BENDING ALLOWANCE = N (.0175 R + .0055 G)

WHEN RADIUS IS GREATER THAN GAUGE.

B.W. GA.No	SIZE	CONSTANT .0055 G
1/4	.250	.001375
4	.238	.001309
5	.220	.001210
6	.203	.0011165
3/16	.1875	.0010312
8	.165	.0009075
9	.148	.0008140
10	.134	.0007370
11	.120	.0006600
12	.109	.0005995
13	.095	.0005225
14	.083	.0004565
15	.072	.0003960
16	.065	.0003575
17	.058	.0003190
18	.049	.0002695
19	.042	.0002310
20	.035	.0001925
21	.032	.0001760
22	.028	.0001540
23	.025	.0001375
24	.022	.0001210

RAD.	CONSTANT .0175 R
1/64	.00027343
1/32	.00054687
3/64	.00082031
1/16	.00109375
5/64	.0013671
3/32	.0016406
7/64	.0019140

RAD.	CONSTANT .0175 R.
1/8	.0021875
9/64	.0024609
5/32	.0027343
11/64	.0030078
3/16	.0032812
13/64	.0035546
7/32	.0038281
15/64	.0041015
1/4	.0043750
17/64	.0046484
9/32	.0049218
19/64	.0051953
5/16	.0054687
21/64	.0057421
11/32	.0060156
23/64	.0062890
3/8	.0065625
25/64	.0068359
13/32	.0071093
27/64	.0073828
7/16	.0076562
29/64	.0079296
15/32	.0082031
31/64	.0084765
1/2	.0087500
33/64	.0090234
17/32	.0092968
35/64	.0095703
9/16	.0098437
37/64	.0101171
19/32	.0103906
39/64	.0106640
5/8	.0109375

RAD.	CONSTANT .0175 R.
41/64	.0112109
21/32	.0114843
43/64	.0117578
11/16	.0120312
45/64	.0123046
23/32	.0125781
47/64	.0128515
3/4	.0131250
49/64	.0133984
25/32	.0136718
51/64	.0139453
13/16	.0142187
53/64	.0144921
27/32	.0147656
55/64	.0150390
7/8	.0153125
57/64	.0155859
29/32	.0158593
59/64	.0161328
15/16	.0164062
61/64	.0166796
31/32	.0169531
63/64	.0172265
1	.0175000
1 1/8	.0196875
1 1/4	.0218750
1 3/8	.0240625
1 1/2	.0262500
1 5/8	.0284375
1 3/4	.0306250
1 7/8	.0328125
2	.035000

TO USE ABOVE TABLE

ADD CONSTANT (.0055 G) OPPOSITE PROPER GAUGE TO CONSTANT (.0175 R) OPPOSITE REQUIRED RADIUS; THIS SUM MULTIPLIED BY DEGREES OF BEND GIVES FLAT PATTERN LENGTH.

W. A. ROOKE, S.B. 7-10-18.

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